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Co-Chairs: Wenzhe Chen, Fujiang University of Technology; Jie Zhang, Harbin Institute of Technology; Xuexi Zhang, Harbin Institute of Technology

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Notch intensification and deformation mode transition with respect to notch depth in Cu50Zr50 metallic glasses

G. J. Yang; B. Xu; Q. Qi; L. T. Kong; J. F. Li, Shanghai Jiao Tong University

ABSTRACT

Metallic glasses (MGs) with various geometrical notches have been one of the most attractive topics because of their potential as engineering structural components. In this work, molecular dynamics simulations were used to analyze the effect of notch depth on the mechanical behavior of Cu50Zr50 MGs. Our results show that both the strength and the deformation mode are sensitive to the notch depth and in particular to the inter-void ligament distance. With increase in the notch depth, the notch intensification becomes more remarkable and the deformation mode changes from shear banding to necking. Further stress distribution analysis shows that the notch intensification is influenced by the stress concentration combined with inter-void ligament distance, while the failure transition is controlled by the maximum shear stress around the notch and the critical value is about 1.5 GPa. These results provide useful guidance for the design of engineering structures and the application of local stress analysis in research based on molecular dynamics simulations.

KEYWORDS: metallic glass, notch, intensification, deformation mode